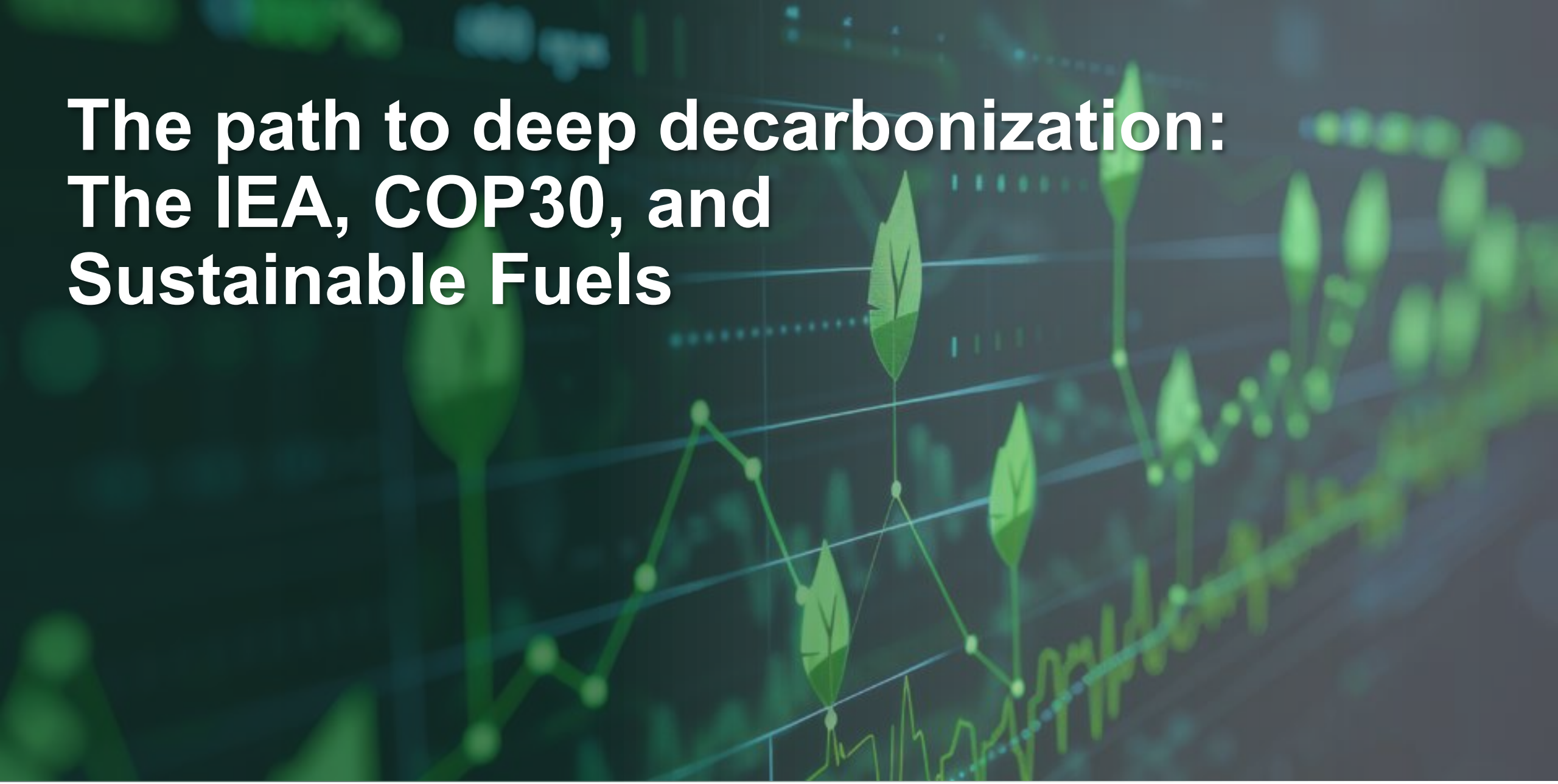

The path to deep decarbonization: The IEA, COP30, and Sustainable Fuels

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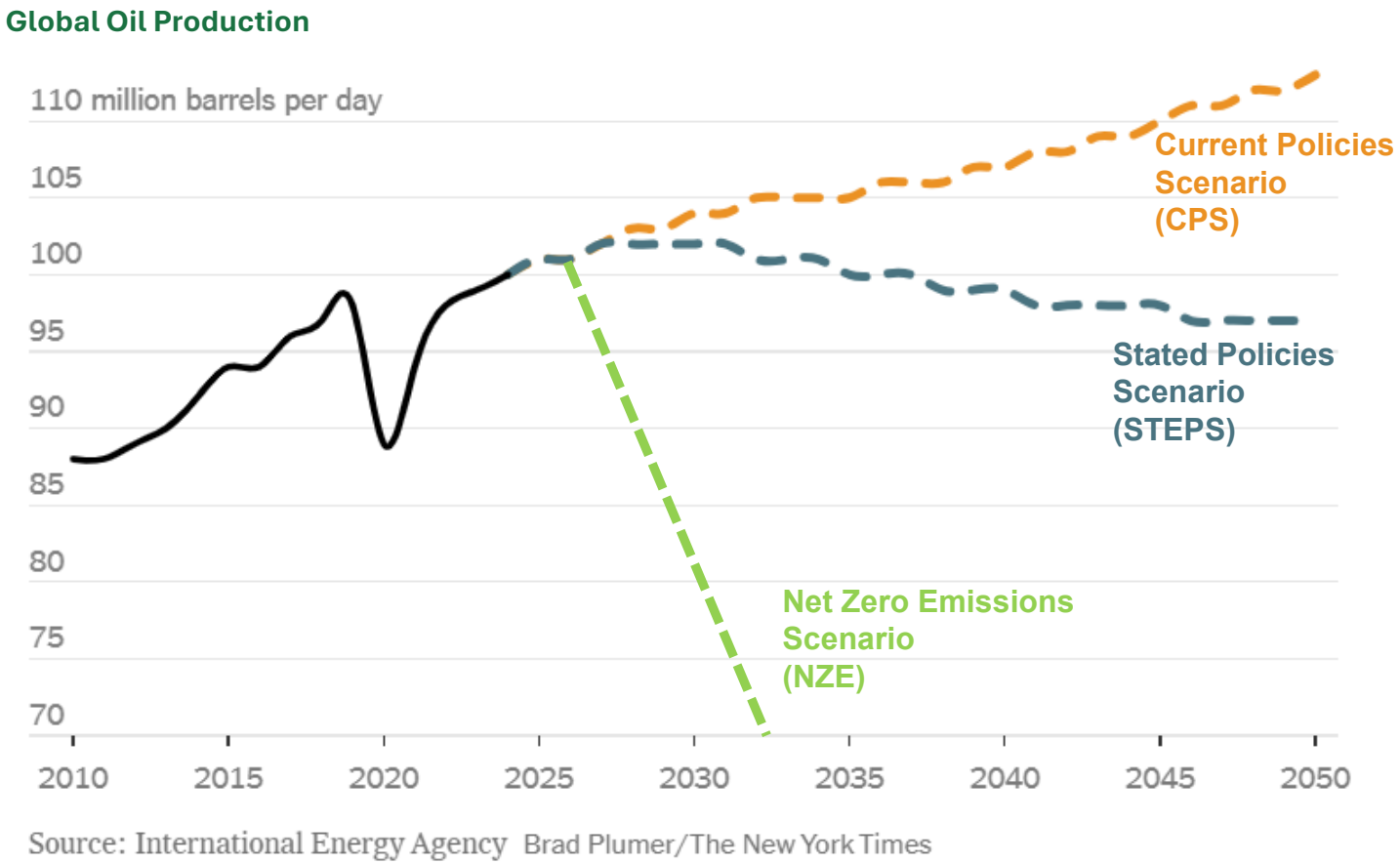
Where are we now?

IEA's World Energy Outlook 2025



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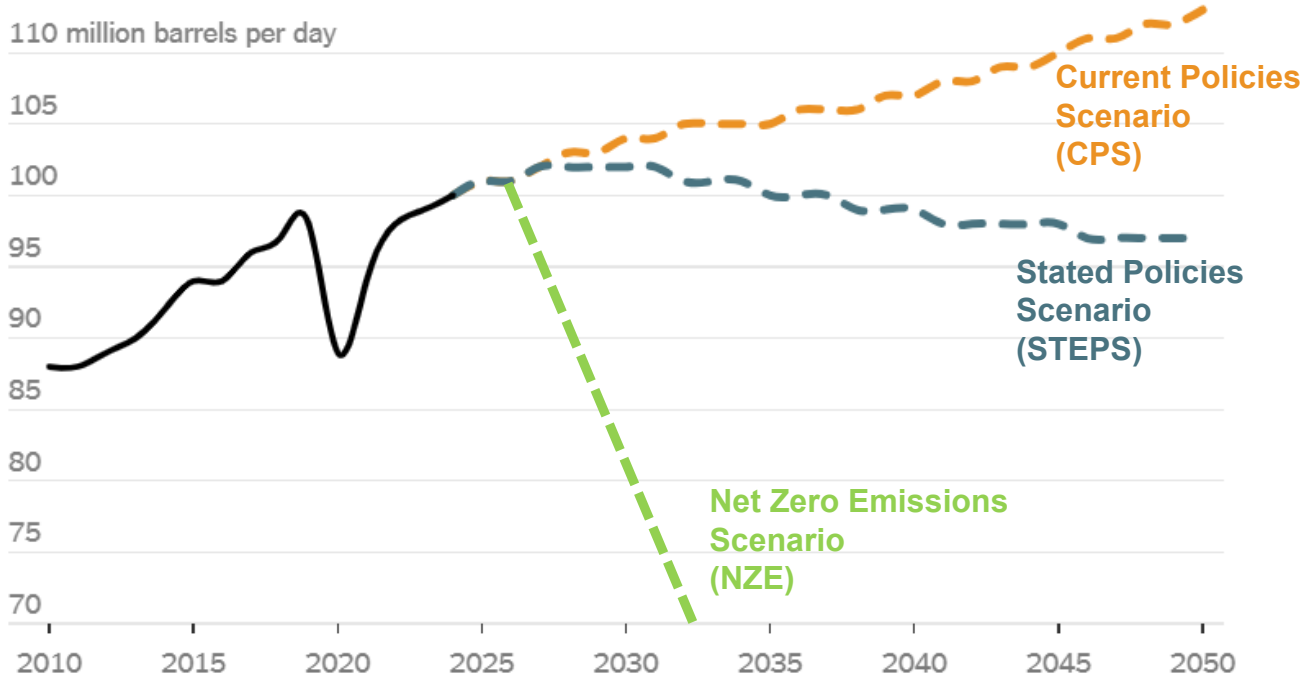
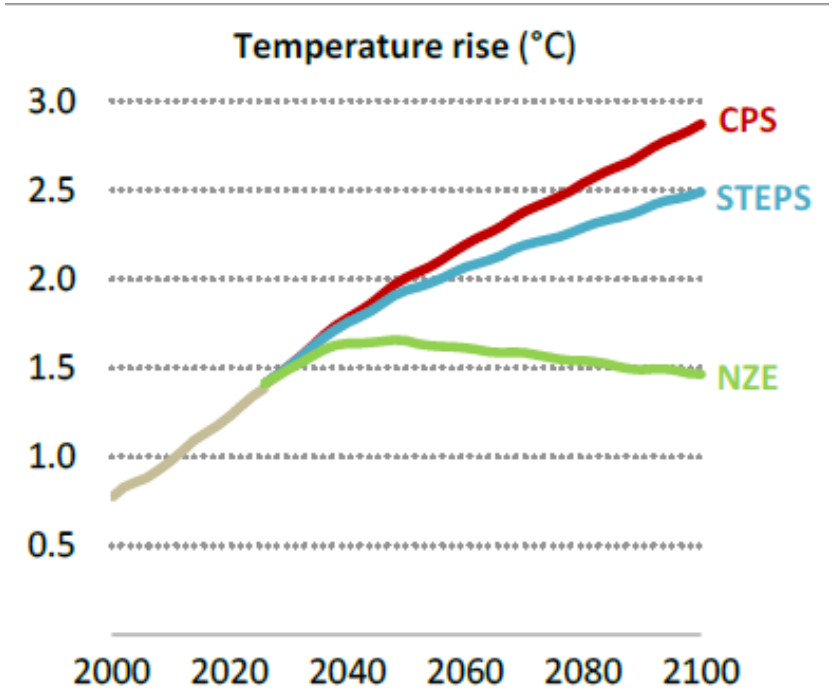
Global Oil Production



Source: International Energy Agency Brad Plumer/The New York Times

Global Average Temperature Rise



The IEA's Net Zero Emissions Scenario
Role of Sustainable fuels in deep decarbonization

Electrification plays a major role, (but) cannot fully decarbonise some key end-use sectors.

Source: IEA World Energy Outlook 2025

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Contribution to final energy consumption:

- 5% today
- 10% in 2035; and
- ~20% in 2050.

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- ~20% in 2050.

Short and medium term:

- drop-in fuels for decarbonising conventional energy technologies;

Long term

- decarbonisation of some hard-to-abate sectors.

Source: IEA World Energy Outlook 2025

How do we get there?

- “With well-designed policies, sustainable fuels can achieve **major lifecycle emissions reductions** compared with conventional fuels. … and in some cases even **deliver net carbon removal**,”

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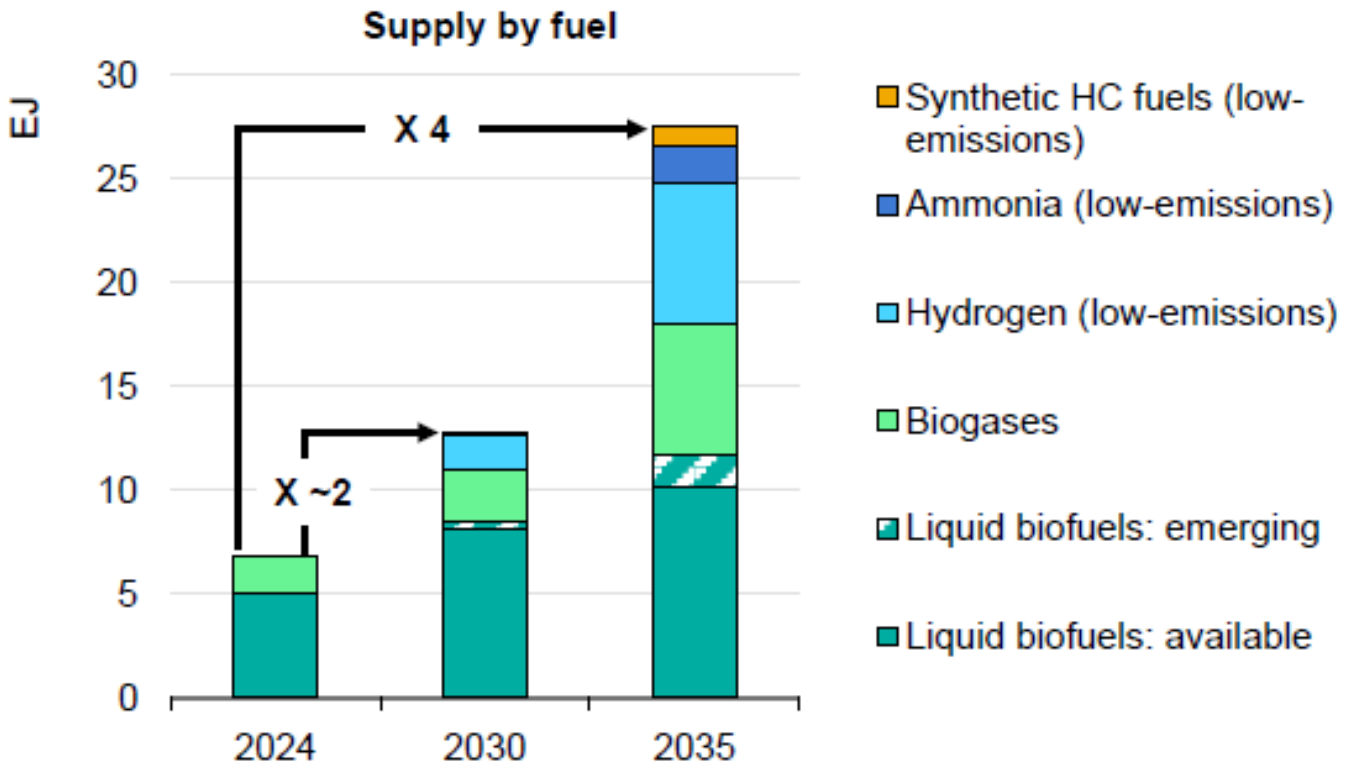
- This can be achieved by rewarding fuels in proportion to their lifecycle GHG savings,
  - directing investment towards the most cost-effective pathways.
- To balance ambition with feasibility, mandates and performance-based standards can include:
  - comprehensive compliance trading systems,
  - cost floors and ceilings
  - safety valves that limit excessive compliance costs if fuel supplies fall short.

How far can we get?

Supply



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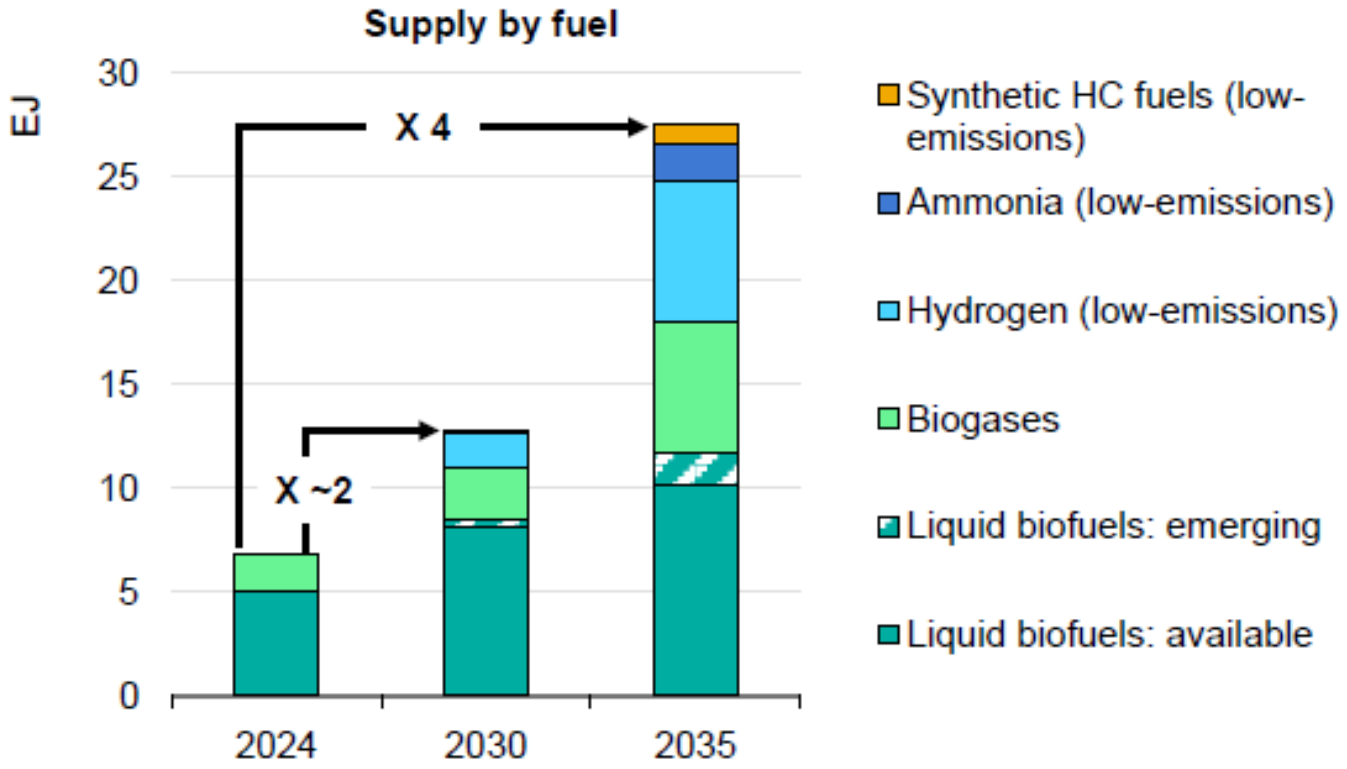
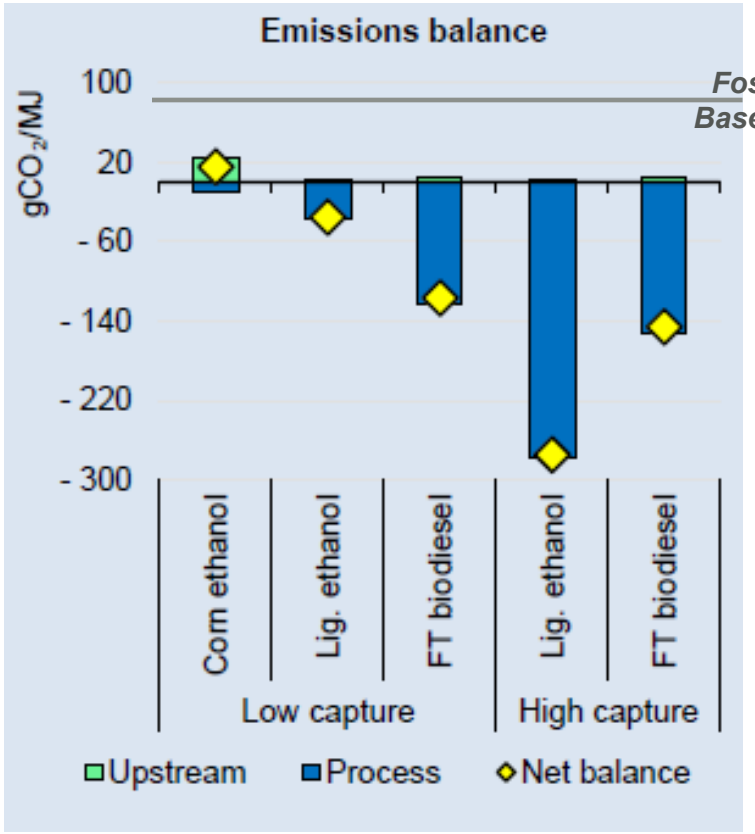
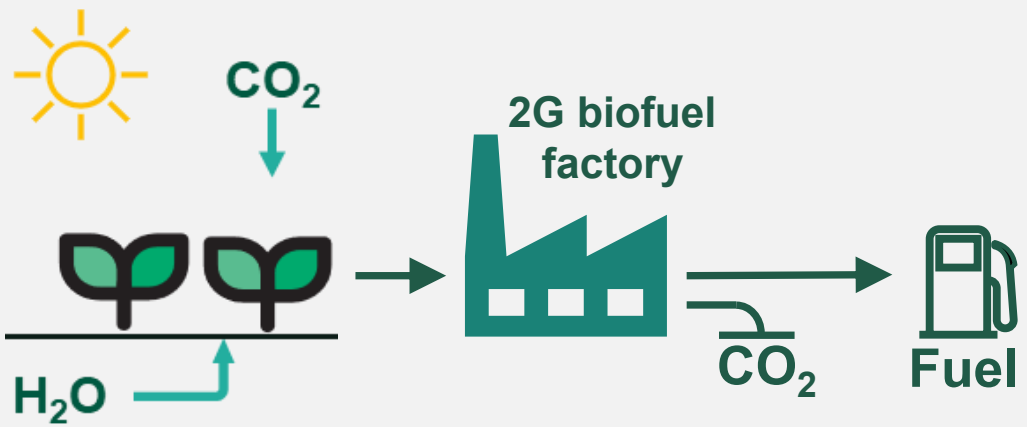


Emissions



Imagine a 2G Biofuel Process Where all the Feedstock Carbon Ends Up in Either the Fuel or a CO_2 Stream Going to Long-Term Storage

Simplified cellulosic biofuel value chain
(*making fuel and CO_2*)



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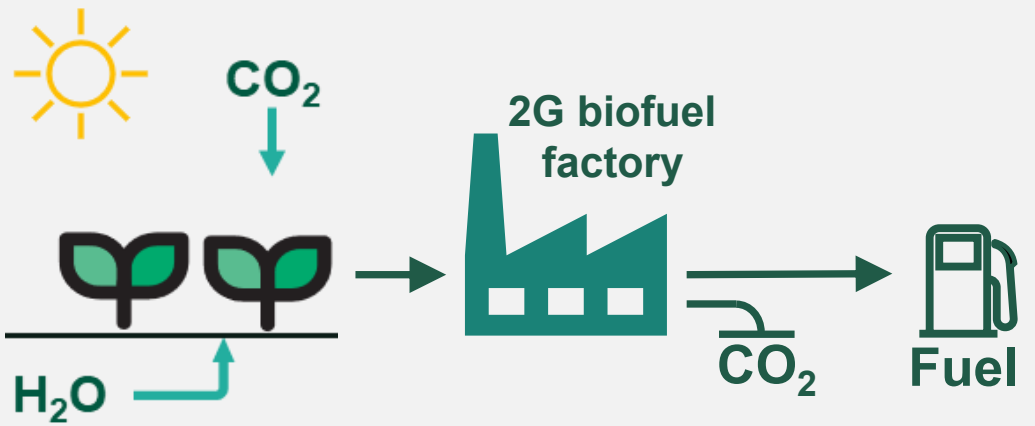

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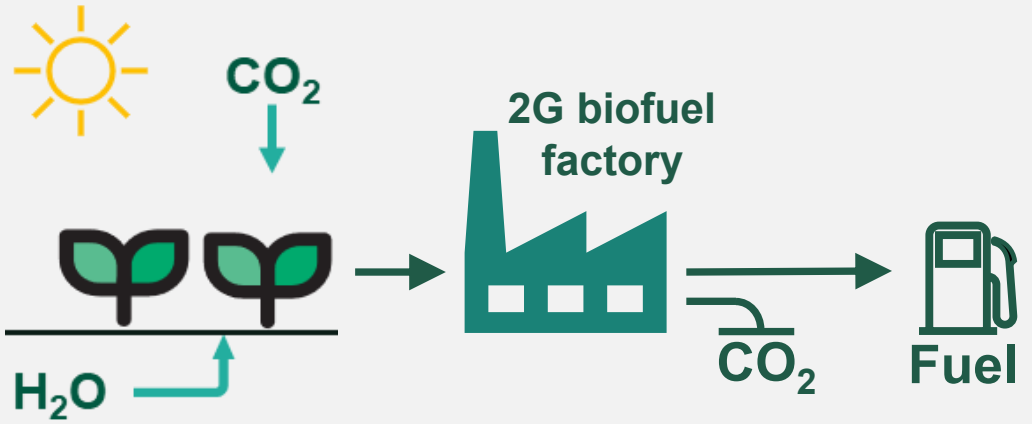

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By combining bioenergy with carbon capture and storage (BECCS)

Triple the climate benefit.

- Every gallon of this carbon-negative fuel erases the emissions of three gallons of fossil fuel.

The implications are huge.

- If biomass once looked able to deliver 20% of net-zero, adding CCS could raise that to 60%.

In the end,

- This approach promises the most cost-effective path to deep decarbonization — even in the hardest-to-abate sectors.

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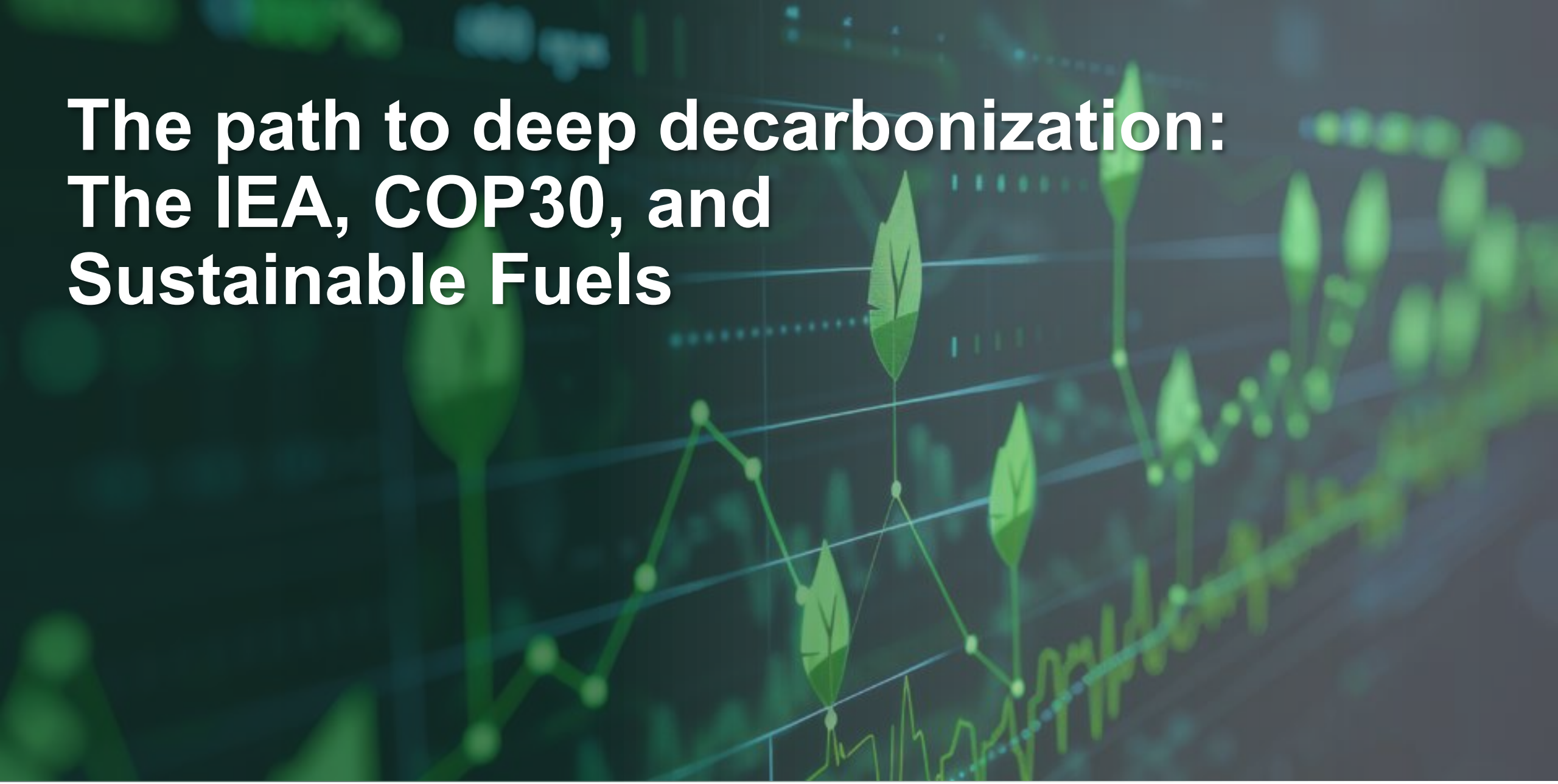

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